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phlogopite from Burgess, Ont., as $Al(SiO_4)_3Mg_3KH_2+Al_2(SiO_4)_3Mg_2K(MgF)$.——Belowsky[27] finds that green hornblende, when subjected for some time to the heat of a bunsen burner, changes its color, the character of its pleochroism, the strength of its double refraction, and the position of its planes of extinction, and becomes in all respects similar to the basaltic variety. Upon the addition of a little sodium chloride[28] to a solution of sodium sulphate, the latter salt crystallizes upon evaporation as *thenardite,* and not as mirabilite. A mixture of potassium and sodium sulphate under the same conditions yield *glaserite.*——A few illustrations of regular growth of pyrite crystals are given by Smolar.[29] Some of the crystals (all of which are from Piedmont and Elba) are probably interpenetration twins according to some new law, while others are regular growth only. The author believes that our knowledge of twinned crystals is still in its infancy, and advises many more observations on regular intergrowths before we conclude as to the conditions of twinning. Rhombic pyramids of sulphur[30] crystallize from picoline or pyridine saturated with sulphuretted hydrogen.——The *oölitic iron ores* of the Cliniton group in the Alleghenies are not cemented concretions, as was supposed, but they are pseudomorphs of bryozoons, or of fragments of these.[31]

ZOOLOGY.

Sipunculus gouldii.—Dr. E. A. Andrews, in a paper[1] that should have received earlier notice, describes the structure of this common east coast Sipunculid. The principal points brought out are the rich peripheral nervous system; the presence of "pseudostomata" in the splanchnic epithelium, the function of which remains unsettled; the division of the alimentary tract into several regions, differentiated by anatomical and histological peculiarities; the probability that the stomach is a sucking organ; the confirmation of the discovery that the reproductive organs were on the posterior surface of the origin of the posterior retractor muscles. Andrews thinks that the points which he has

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[27] *Neues Jahrb. f. Min.*, etc., 1891, I., p. 291.

[28] Retgers. Ib., 1891, I., p. 276.

[29] *Zeits. f. Kryst.*, XVIII., 1890, p. 475.

[30] Ahrens. *Ber. d. deutsch. chem. Ges.* XXIII., 1890, p. 2708.

[31] *Amer. Journ. Sci.*, Jan., 1891, p. 28.

[1] Studies Biol. Lab. Johns Hopkins Univ., IV., p. 389, 1890.

brought out emphasize the similarities which exist between the Sipunculids and Phoronis. He also thinks that in spite of the absence of metamerism there is nothing in the anatomy of the adult which could not be explained on the theory of lost segmentation in these worms, while he institutes a striking comparison between the gonads of the Polychæte placed on the posterior side of a dissepiment and those of Sipunculus attached to the posterior surface of the pharyngeal retractors.

Sipunculus nudus.—H. B. Ward describes[2] the anatomy and histology of this Mediterranean form. The material at command embraced only the anterior portions of the body, so no study was made of many features worked out by Andrews. The histology of the body-wall and of the nervous system receive most attention. Among the many points brought out, the most interesting is the existence of a "cerebral organ," consisting of a canal opening to the exterior in the dorsal median line, and connecting posteriorly with an area in close connection with the brain, which the author is inclined to regard as sensory, and to homologize with similarly situated organs in Phymosoma and *Sipunculus gouldii.* The general accounts of structure given by Andrews and Ward agree well in broader features, but differ considerably in detail. From the evidence afforded by the nervous system Ward is inclined to the view that there is only a remote relationship between Sipunculus and the Annelids.

The Eye in Blind Crayfishes.—G. H. Parker has studied[3] the eyes in *Cambarus setosus* and *C. pellucidus.* In both species the optic ganglion and optic nerve are present, the latter terminating in the hypodermis. In *C. setosus* the retina has almost completely degenerated, while in *C. pellucidus* it is represented by a thicker portion of the hypodermis with scattered multinuclear granulated bodies. These Parker regards as degenerated clusters of cone cells. Thus *Cambarus setosus* from the caves of Missouri has gone farther in the line of ophthalmic degeneration than its ally from the caves of Kentucky and Indiana.

"**The Compound Eye of Crustaceans**" is the title of a larger paper[4] by the same author. He gathers together all that is known, adding much himself in the endeavor to solve certain problems surrounding these organs. The retina of the compound eye is composed of a number of similar units or ommatidia, but the structure of the ommatidium varies considerably in different groups. One question which Parker asks is: "What are the means by which ommatidial types are modified, and what is the significance of the changes through which these types pass?" The argument of the present paper is that the ommatidia composed of four cells are more primitive than those containing many cells, and to show how cell-division can have caused the modifications and what other factors may be concerned.

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[2] Bull. Mus. Comp. Zool., XXI., No. 3, 1891.

[3] Ib., XX., No. 5, 1890.

[4] Ib., XXI., No. 2, 1891.

Parker recognizes three types of compound eye so far as retinal structure is concerned: I., represented by Decapods, Schizopods, Stomatopods, Isopods, Leptostra, and Branchiopodidæ of the Phyllopods, has the retina a simple thickening in the superficial ectoderm; II., in Apodidæ, Estheridæ, and Cladocera, the retina does not retain a superficial position, but becomes covered by a fold of the integrement, the pocket remaining open in some and closed in others; III., in Amphipods, and possibly Copepods, the retina is completely separated from the hypodermis, not by an infolding, as in the second type, but by delamination. Of this the author is not certain from actual observation, but he gives a number of facts which warrant his conclusion. Types II. and III. pass through a stage comparable to type I., and hence may be regarded as derivatives from it.

Detailed descriptions of the structure of the ommatidia in various forms are given and illustrated by numerous figures. Continuing his work with that of his predecessors Parker tabulates the ommatidia of the different Curstacea in a manner which conveys at a glance the difference between them so far as numbers of cells are concerned. In an ommatidium going from the surface to the optic nerve there are present (1) the cells of the corneal hypodermis which secrete the cornea; (2) the cone cells, varying in number from two to five, one function of which is to form the crystalline cone; (3) the retinular cells, which may be either undifferentiated or divided into two groups, proximal and distal, the total number varying between three and nine; and (4) accessory pigment, cells which are either of ectodermal or mesodermal origin, all of the rest of the eye being clearly ectodermal.

All compound eyes of the Crustacea are thus clearly built upon a common plan, and the variations between them are traced to (1) the differentiation of cells, (2) the suppression of cells, and (3) probably to multiplication of cells by division, although this last has not been demonstrated by observation.

Parker traces the origin of the ommatidium to such structures as are seen in the Chætopod Nais, where there is an eye composed of a few large transparent cells, the distal portions of which are in part covered by pigment cells. The transparent cells are the forerunners of the cone cells, while the pigment cells represent an as yet undifferentiated retinular region. This view is clearly opposed to that of Watasi, already noticed in our pages, by which each ommatidium is regarded as an involution of ectodermal cells, the members of which may still retain their power of secreting cuticular structures. The ommatidium, on the contrary, is a differentiated cluster of cells in a continuous unfolded epithelium. Patten's view that the ommatidium is a hair-bearing sense-bud receives no confirmation in Parker's studies.

Eyes in Arcturus.—Beddard describes[5] the eyes in deep and shallow-water species of Arcturus. He finds that some at least of the deep-sea forms show evidences of degeneration in the visual apparatus. Thus in three species he finds the conical lens showing signs of becoming opaque, while in three others there is alteration of size and curvature. In several others the rhabdom affords similar evidence, while in many deep-sea forms the decrease in amount of pigment is also regarded as an indication of degeneracy.

The Northern Limits of the Scorpions.—During a recent collecting trip to the Bad Lands of the Hot Creek Valley, in the extreme northwestern corner of Nebraska, Mr. F. C. Kenyon, a member of the party, found a living scorpion (Buthus sp.). This is, so far as I am aware, some three hundred miles further north than any member of the group has ever been found east of the Rocky Mountains. West of the mountains, I am informed by Mr. Henshaw, they extend north to Oregon and Washington.—J. S. KINGSLEY.

Glands in Orthoptera.—H. Garman describes, in the current volume of *Psyche*, peculiar glandular structures borne between the ninth and tenth terga of the abdomen of the cave cricket. Their function is unknown; but the author points out the fact that scent glands occur in the females of certain Bombycids. Apparently he is not familiar with the recent literature of abdominal glands in the Hexapoda.

Notes on Tunicates.—Herdman thinks[6] that the usual divisions of the Tunicates, while convenient, do not express the true relationships of these forms. According to him, the Synascidiæ are in reality a polyphyletic group, the members of which touch the Ascidiæ simplices at various points. Hence a strictly phylogenetic classification will ignore the Ascidiæ Compositæ of our text-books, although the division may be retained for convenience.

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[5] Proc. Zool. Socy. London, 1890, p. 365, pl. XXXI.

[6] *Nature*, June 11th, 1891.

Walter Garstang[7] gives the first part of a review of the Tunicata of Plymouth, England. Species of the families Clavellinidæ, Perophoridæ, and Diazonidæ are enumerated and described at length. Pycnoclavella is a new genus.

W. A. Herdman promises a monograph of the British Tunicates.

The Affinities of Polypterus.—H. B. Pollard has studied some points in the structure of Polypterus which, he thinks,[8] throw light upon the relationships of this form. The ear, except in lacking the ductus endolymphaticus, is distinctly Urodele in its character, as is shown by the immense sacculus, which reaches the level with the semicircular canals, and by proximal division of the auditory nerve. The so-called opisthotic corresponds to the Urodele petrosum; the opthalmicus profundus and superficialis pass through a foramen into the nasal capsule; the supracranial fontanelle is partially roofed over by cartilage; the "paired vomer" is really dermopalatine, and corresponds to the so-called vomer of the Batrachia. The jaw muscles correspond to the Batrachian rather than the Teleostome type, while the nervous system corresponds almost to detail with that of larval Salamandra. The conclusion to be drawn from these facts is that the ancestry of the Urodeles must be sought in Crossopterpgians. Turning now to the affinities of the other piscine forms, Pollard promises to show homologies of Polypterus with the Stegocephali, while the position of the Dipnoi and Holocephali must be different from that usually accorded them. Chimæra, etc., are Dipnoan forms which have lost their dermal bones, and are retrograded in some respects toward the Selachian type. If the Dipnoan forms are to be regarded as ancestors of the Batrachia, we should expect to find in the larval Urodeles the same relations of quadrate and palatines to the cranium, but such is not the case. In the young Cryptobranchus the quadrate has nearly the same relationships as in Polypterus. The suprapharyngobranchial I. articulates with the auditory capsule, and from it the author traces the origin of the Urodele stapes. This paper is a sample of the errors into which it is easy to fall in ignorance of the facts of paleontology.

The Pineal Organ of Ichthyophis and Protopterus.—Burckhardt thinks[9] that all previous authors have mistaken an arterial plexus for the pineal organ in these forms. In Ichthyophis, on account of the enormous folding of the arterial plexus the roof of the thalamencephalon is completely covered. It falls into an anterior wall, embraces the ganglia habenulæ on either side, and a posterior wall between the posterior and superior commissures. At the spot where these swellings meet is a small pear-shaped vesicle, which extends into the space between the hinder part of the arterial plexus and the roof of the thalamus. Development shows that this is the pineal organ. In Protopterus the pineal organ is a small, irregular sac, which extends directly upwards from the boundary between the mid- and twixt-brains into the abundant connective tissue of that organ. Burckhardt has not yet traced its lumen into connection with the third ventricle.

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[7] Jour. Marine Biol. Assn. United Kingdom, 1891, Vol. II., p. 47.

[8] *Anat. Anzeizer*, VI., 338, 1891.

[9] *Anat. Anzeiger*, VI., 348, 1891.

Fœtal Period of the Seal.—Grieg has studied the period of pregnancy of *Phocæna communis.*[10] He analyses the known literature, and finds great diversity of opinion. He then studies thirty-five embryos, with dates of capture of the mother, and comes to the conclusion that the period is about nine or ten months. According to the Norwegian fishermen, copulation takes place usually in July and August; but he finds that the breeding season may extend, according to locality, from July to October, and the young are born from March to June. At the time of birth the young measure from 700 to 860 millimeters, and may reach a length of 880 millimeters.

Extent of the South American Fresh-Water Fish Fauna.—There are more fresh-water fishes in the neotropical than in any other region. A comparison made by Carl and Rosa Eigenmann of the latest lists of European and North American fresh-water fishes, with a list of the South American species, shows the extent of the South American fauna. In summing up the species they find 126 European, 587 North American, and 1,147 South American species. (Proceeds. U. S. Nat. Mus., Vol. XIV., pp. 1–81.)

The Chromididæ of the Fresh Waters of Madagascar.—One of the most interesting peculiarities of the fresh-water fish fauna of Madagascar is the presence of the Chromididæ, coincident with the absence of the Cyprinidæ and the Characinidæ, although these two groups are found in Africa, and the great paucity of Siluridæ, so that the Chromididæ are, so to speak, the only fresh-water fishes of this large island.

At the present time the Chromididæ are a family of South America and of Mexico, 230 species out of 260 having been described from that region.

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[10] *Jena Zeitschr.*, XXV., 544, 1891.

Known for some years past by a single species referred to one of the most widely distributed forms in Africa, *Chromis niloticus*, the Chromididæ are to-day represented in Madagascar by nine series belonging to four genera, the affinities of which are as follows:

The Paretroplus are distinguished from the Hemichromis, which belong to Africa and to Asia Minor, by a greater number of anal spines. The Paretroplus belong to an African type.

If the Paratilapia have certain affinities with the Hemichromis, they are still more closely allied to the Acara, from which they are distinguished only by the indentations of the bony projections of the external branchial arch; but the Acara belong to tropical South America.

The Paracara also have close affinities with the Acara.

As to the Ptychochromis, Steindacher has shown that they are separated from the Chromis by the presence of a lemelliform, compressed projection from the upper part of the first branchial arch. This character is found in the genus Geophagus, from South America.

The genera of the Chromididæ peculiar to South America have ctenoid scales, while those of Africa and Western Asia have cycloid. Among the Chromididæ of Madagascar, the Paretroplus, we may say, belong to the African type, as they have cycloid scales. All the other Chromididæ of Madagascar have ctenoid scales. Thus the Chromididæ of Madagascar are more closely related to the fresh-water species of tropical South America than to the African species.

From a study of the herpetological and ichthyological fauna of the fresh waters of Madagascar, it appears that this island, Southern Africa, and South America formed in a pre-Tertiary epoch, parts of the same continent, which had a fauna of the same origin and character. While South America and Africa have received since the Pliocene epoch invasions of animals of another creation, Madagascar has had, on the contrary, no connection since that epoch with any other land, and presents to-day the same fresh-water fish fauna as it did in the Middle Tertiary, without any addition save that of the Carassius recently introduced. The division between Madagascar and Southern Africa must have happened before the commencement of the Miocene, for neither Cyprinidæ or Characinidæ are found in Madagascar. Communication must have lasted for a much longer time between South America and the South of Africa, which, toward the Pliocene epoch, had received an influx of Characins; whilst the Cyprins, introduced into Africa from the European continent, or rather from the South Asiatic, had hardly penetrated South America. (Dr. H. E. Sauvage, Bull. Soc Zool. de France, 1891, p. 190.)